

WHAT IS CLAIMED IS:

1. A method for reducing odor, said method comprising:
modifying particles having a positive zeta potential with a transition metal;
and

5 contacting said modified particles with an odorous compound, said
transition metal providing one or more active sites for capturing said odorous
compound.

2. A method as defined in claim 1, wherein said particles are formed from a
material selected from the group consisting of silica, alumina, zirconia, magnesium
10 oxide, titanium dioxide, iron oxide, zinc oxide, copper oxide, organic compounds,
and combinations thereof.

3. A method as defined in claim 1, wherein said particles comprise
alumina.

4. A method as defined in claim 3, wherein said particles comprise silica
15 coated with alumina.

5. A method as defined in claim 1, wherein said particles have an average
size of less than about 500 microns.

6. A method as defined in claim 1, wherein said particles have an average
size of less than about 100 nanometers.

20 7. A method as defined in claim 1, wherein said particles have an average
size of from about 4 to about 20 nanometers.

8. A method as defined in claim 1, wherein said particles have a surface
area of from about 50 to about 1000 square meters per gram.

9. A method as defined in claim 1, wherein said transition metal is selected
25 from the group consisting of scandium, titanium, vanadium, chromium,
manganese, iron, cobalt, nickel, copper, zinc, silver, gold, and combinations
thereof.

10. A method as defined in claim 1, wherein said particles have a zeta
potential of greater than about +20 millivolts.

30 11. A method as defined in claim 1, wherein said particles have a zeta
potential of greater than about +30 millivolts.

12. A method as defined in claim 1, wherein said particles have a zeta
potential of greater than about +40 millivolts.

13. A method as defined in claim 1, wherein a bifunctional chelating agent complexes said transition metal to said particles.

14. A method as defined in claim 13, wherein said bifunctional chelating agent contains moieties selected from the group consisting of hydroxyl, carboxy,
5 imino, amino, carbonyl, and combinations thereof.

15. A method as defined in claim 13, wherein said bifunctional chelating agent contains one or more iminodiacetic acid groups.

16. A method as defined in claim 15, wherein said bifunctional chelating agent contains ethylenediaminetetraacetic acid.

10 17. A method as defined in claim 13, wherein said bifunctional chelating agent contains one or more aromatic polyols.

18. A method as defined in claim 17, wherein at least one of said aromatic polyols is a catechol.

15 19. A method as defined in claim 19, wherein said catechol also contains an iminodiacetic acid group.

20. A method as defined in claim 13, wherein said bifunctional chelating agent contains a dye.

21. A method as defined in claim 20, wherein said dye contains an anthraquinone.

20 22. A method as defined in claim 1, wherein said odorous compound is selected from the group consisting of mercaptans, ammonia, amines, sulfides, ketones, carboxylic acids, aldehydes, terpenoids, hexanol, heptanal, pyridine, and combinations thereof.

25 23. A method as defined in claim 1, further comprising applying said modified particles to a substrate.

24. A method as defined in claim 23, wherein said substrate comprises a nonwoven, woven, or paper web.

25. A method for reducing odor, said method comprising:
providing particles coated with alumina, wherein said particles have a zeta
30 potential greater than about +20 millivolts;

modifying said alumina-coated particles with a transition metal using a bifunctional chelating agent; and

contacting said modified particles with an odorous compound, said

transition metal providing one or more active sites for capturing said odorous compound.

26. A method as defined in claim 25, wherein said particles are formed from silica.

27. A method as defined in claim 25, wherein said particles have an average size of less than about 100 nanometers.

28. A method as defined in claim 25, wherein said transition metal is selected from the group consisting of scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, silver, gold, and combinations thereof.

29. A method as defined in claim 25, wherein said bifunctional chelating agent contains one or more iminodiacetic acid groups.

30. A method as defined in claim 29, wherein said bifunctional chelating agent contains ethylenediaminetetraacetic acid.

31. A method as defined in claim 25, wherein said bifunctional chelating agent contains one or more aromatic polyols.

32. A method as defined in claim 31, wherein at least one of said aromatic polyols is a catechol.

33. A method as defined in claim 32, wherein said catechol also contains an iminodiacetic acid group.

34. A method as defined in claim 25, wherein said bifunctional chelating agent contains a dye.

35. A method as defined in claim 34, wherein said dye contains an anthraquinone.

36. An odor control composition comprising particles coated with alumina that are modified by a transition metal, said particles having a positive zeta potential, wherein said transition metal provides one or more active sites for capturing an odorous compound.

37. An odor control composition as defined in claim 36, wherein said particles are formed from silica.

38. An odor control composition as defined in claim 36, wherein said particles have an average size of less than about 100 nanometers.

39. An odor control composition as defined in claim 36, wherein said

particles have a surface area of from about 50 to about 1000 square meters per gram.

40. An odor control composition as defined in claim 36, wherein said transition metal is selected from the group consisting of scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, silver, gold, and combinations thereof.

41. An odor control composition as defined in claim 36, wherein said particles have a zeta potential of greater than about +20 millivolts.

42. An odor control composition as defined in claim 36, wherein said particles have a zeta potential of greater than about +30 millivolts.

43. An odor control composition as defined in claim 36, wherein said particles have a zeta potential of greater than about +40 millivolts.

44. An odor control composition as defined in claim 36, wherein a bifunctional chelating agent complexes said transition metal to said particles.

45. An odor control composition as defined in claim 44, wherein said bifunctional chelating agent contains one or more iminodiacetic acid groups.

46. An odor control composition as defined in claim 45, wherein said bifunctional chelating agent contains ethylenediaminetetraacetic acid.

47. An odor control composition as defined in claim 44, wherein said bifunctional chelating agent contains one or more aromatic polyols.

48. An odor control composition as defined in claim 47, wherein at least one of said aromatic polyols is a catechol.

49. An odor control composition as defined in claim 48, wherein said catechol also contains an iminodiacetic acid group.

50. An odor control composition as defined in claim 44, wherein said bifunctional chelating agent contains a dye.

51. An odor control composition as defined in claim 50, wherein said dye contains an anthraquinone.

52. A substrate for reducing odor, said substrate being applied with particles coated with alumina that are modified with a transition metal, said particles having a positive zeta potential, wherein said transition metal provides one or more active sites for capturing an odorous compound.

53. A substrate as defined in claim 52, wherein said particles are formed

from silica.

54. A substrate as defined in claim 52, wherein said particles have an average size of less than about 100 nanometers.

5 55. A substrate as defined in claim 52, wherein said particles have a surface area of from about 50 to about 1000 square meters per gram.

56. A substrate as defined in claim 52, wherein said transition metal is selected from the group consisting of scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, silver, gold, and combinations thereof.

10 57. A substrate as defined in claim 52, wherein said particles have a zeta potential of greater than about +20 millivolts.

58. A substrate as defined in claim 52, wherein said particles have a zeta potential of greater than about +30 millivolts.

15 59. A substrate as defined in claim 52, wherein said particles have a zeta potential of greater than about +40 millivolts.

60. A substrate as defined in claim 52, wherein a bifunctional chelating agent complexes said transition metal to said particles.

61. A substrate as defined in claim 60, wherein said bifunctional chelating agent contains one or more iminodiacetic acid groups.

20 62. A substrate as defined in claim 61, wherein said bifunctional chelating agent contains ethylenediaminetetraacetic acid.

63. A substrate as defined in claim 60, wherein said bifunctional chelating agent contains one or more aromatic polyols.

25 64. A substrate as defined in claim 63, wherein at least one of said aromatic polyols is a catechol.

65. A substrate as defined in claim 64, wherein said catechol also contains an iminodiacetic acid group.

66. A substrate as defined in claim 60, wherein said bifunctional chelating agent contains a dye.

30 67. A substrate as defined in claim 66, wherein said dye contains an anthraquinone.

68. A substrate as defined in claim 52, wherein the substrate comprises a nonwoven, woven, or paper web.

69. A substrate as defined in claim 52, wherein the solids add-on level of said modified particles is from about 0.001% to about 20%.

70. An absorbent article that comprises the substrate of claim 52.

71. An absorbent article as defined in claim 70, further comprising at least one liquid-transmissive layer and a liquid-absorbent core, wherein said substrate forms at least a portion of said liquid-transmissive layer, said liquid-absorbent core, or combinations thereof.

72. An absorbent article as defined in claim 71, wherein the absorbent article includes a liquid-transmissive liner, a liquid-transmissive surge layer, a liquid-absorbent core, and a vapor-permeable, liquid-impermeable outer cover, said substrate forming at least a portion of said liner, said surge layer, said absorbent core, said outer cover, or combinations thereof.

73. A paper product that comprises the substrate of claim 52.

74. A facemask that comprises the substrate of claim 52.